(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 158(3) EPC

| Vorlage | Ablage | 𝟹𝟷𝟽𝟾𝟻𝙉 |
|---|---|---|
| Haupttermin | | |

Eing.: 2 0. SEP. 200 2

PA. Dr. Peter Riebling

| Bearb.: | | Vorgelegt. |

(72) Inventor: NISHIDA, Masato
37-5, Takehana Ougi-cho,
Yamashina-ku
Kyoto-shi,
Kyoto 607 (JP)

Inventor: ISHITUKA, Tomoaki
4-2-1, Matsumaedai,
Moriya-machi
Kitasouma-gun,
Ibaraki 302-01 (JP)

Inventor: OSHIMA, Toshio
Ekuserento 6-202,
277-1, Togashira
Toride-shi,
Ibaraki 302 (JP)

(74) Representative: Selting, Günther et al
Patentanwälte
von Kreisler-Selting-Werner,
Bahnhofsvorplatz 1 (Deichmannhaus)
D-50667 Köln (DE)

(54) **OPTICAL MARK READER FOR LATENT IMAGE MARK.**

(57) A high-reliability optical mark reader for a latent image mark capable of accurately reading code information of a latent image mark. The reader comprises a projector element (4) for projecting onto the surface of the latent image mark (15), which contains a fluorescent substance and has specified information, light having a wavelength for excitation of the fluorescent substance, and a light receiving element (8) for receiving fluorescence emitted from the surface of the latent image mark (15). A range where a latent image mark is readable is defined with an intersection of optical axes of the projector element and the light receiving lement as a reference, and a crossing angle (θ) of the two optical axes is restricted to 40° or less.

Fig. 2
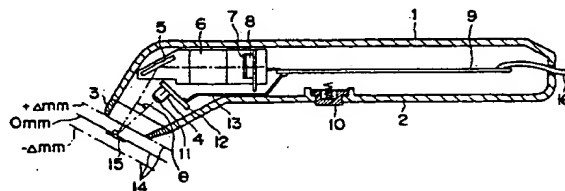


EP 0 652 529 A1

# TECHNICAL FIELD

The present invention relates to an optical reading apparatus for optically reading a latent image mark containing a fluorescent substance by projecting infrared rays to the latent image mark and optically detecting light emitted by the latent image mark. More particularly, the present invention relates to the disposition relationship between a light-projecting member and a light-receiving member of a handy type optical reading apparatus for reading the information of the latent image mark by bringing the optical reading apparatus into contact with an object such as a commodity on which the latent image mark has been formed or moving it to a position close to the object.

# BACKGROUND ART

In a conventional bar code of reflection type, printing ink containing carbon black is generally used. A bar code is printed on a sheet of paper with the printing ink, and a bar code reader optically detects the difference between the reflectivity of a bar code-printed portion of the paper and that of a bar code-unprinted portion thereof so as to read the code information which the bar code has.

The bar code of reflection type has, however, a disadvantage of causing errors in reading the information of the bar code in that the outlook of the commodity is damaged because the bar code is printed on the surface of a commodity or the like or the above-described reflectivity difference becomes small when the bar code-printed surface of the commodity is soiled.

In order to overcome the disadvantage, there are proposed various methods of printing a latent image mark containing fluorescent substances and projecting infrared rays to the latent image mark so as to optically detect light emitted by the latent image mark.

Fig. 12 is a view for describing this kind of conventional optical reading apparatus. A latent image mark 100 such as a bar code is printed on a mark carrier 101, for example, a commodity, a component or the like. The latent image mark 100 contains fluorescent fine powder. A projecting member 103 projects light for exciting the fluorescent substances and as a result, fluorescence is emitted by the latent image mark 100 and received by a light-receiving member 104, so that the code information of the latent image mark 100 is read optically.

When the above-described conventional optical reading apparatus is used as a handy type optical reading apparatus, it is incapable of reading the code information of the latent image mark 100 correctly, thus causing erroneous detection and being unreliable in its performance.

Having made various researches on the causes, the present inventors found that the angle at which the optical axis of the projecting member 103 of the optical reading apparatus intersects with that of the light-receiving member 104 thereof and the state of the surface of the mark carrier 101 on which the latent image mark 100 has been printed relate to reading accuracy greatly.

That is, supposing that the optical reading apparatus is mechanically fixed to a predetermined position; the latent image mark 100 is printed on the mark carrier 101 such as a sheet of paper having a flat surface; and the mark carrier 101 is guided by a guide member mounted on the optical reading apparatus. If the distance between the projecting member 103 and the latent image mark 100 and the distance between the light-receiving member 104 and the latent image mark 100 are always constant, the code information of the latent image mark 100 can be read comparatively correctly, even though the intersection angle $\theta$ formed between the optical axis of the projecting member 103 and that of the light-receiving member 104 is as great as 45°-60° as shown in Fig. 12.

In the case of a manually operated handy type optical reading apparatus, the reading position of the light-receiving member 104 becomes non-uniform in relation to the latent image mark 100 or the detection aperture surface of the optical reading apparatus becomes oblique or moves in relation to the surface of the latent image mark 100. Further, when the surface state of the mark carrier 101 on which the latent image mark 100 has been printed is irregularly convex or concave as in the case of a confectionery bag or curved or stepped as in the case of a component, the distance between the projecting member 103 and the latent image mark 100 and the distance between the light-receiving member 104 and the latent image mark 100 become nonuniform, respectively.

It has been found that in reading the code information of the latent image mark 100 in such a condition, if the intersection angle $\theta$ formed between the optical axis of the projecting member 103 and that of the light-receiving member 104 is as great as 45°-60°, the code information of the latent image mark 100 cannot be correctly read, thus causing erroneous detection of the code information of the latent image mark 100.

It is accordingly an object of the present invention to solve the above-described disadvantages and provide an optical reading apparatus for reading a latent image mark reliable in correctly reading the code information of the latent image mark.

## DISCLOSURE OF INVENTION

In order to achieve the aforementioned object, according to one aspect of the present invention, it is so constructed to comprise a light-projecting member (4) for projecting on a surface of the latent image mark light having a wavelength to excite a fluorescent substance contained in the latent image mark (15) having desired information; and a light-receiving member (8) for receiving fluorescence emitted from the surface of the latent image mark, a range in which the latent image mark can be read is formed by setting a point at which an optical axis of the light-projecting member and that of the light-receiving member intersect with each other as a reference, and an intersection angle between the two optical axes is restricted to 40° or less.

As described above, according to the present invention, even though the distance between the light-projecting member and the latent image mark and the distance between the light-receiving member and the latent image mark are nonuniform, adverse effect can be reduced to the utmost by setting the intersection angle between the two optical axes of the light-projecting and receiving members on the latent image mark to 40° or less. Thus, the present invention can provide a reliable handy type optical reading apparatus capable of reading the latent image mark printed on the mark carrier regardless of whether the surface of the mark carrier is flat, irregular, curved, or stepped.

## BRIEF DESCRIPTION OF DRAWINGS

These and other objects and features of the present invention will become clear from the following description taken in conjunction with the preferred embodiments thereof with reference to the accompanying drawings, and in which:

Fig. 1 is a plan view showing a handy type optical reading apparatus, according to an embodiment of the present invention, in which some parts are cut out;

Fig. 2 is a sectional view showing the optical reading apparatus shown in Fig. 1;

Fig. 3 is a plan view showing a state in which an upper frame of a unit, disposed on a light-receiving side, to be used in the optical reading apparatus of Fig. 1 is removed;

Fig. 4 is a sectional view showing the unit, disposed on the light-receiving side, shown in Fig. 3;

Fig. 5 is a schematic view for describing an optical system of the optical reading apparatus shown in Fig. 1;

Fig. 6 is a schematic view for describing the optical system of the optical reading apparatus shown in Fig. 1;

Fig. 7 is a characteristic view showing the relationship between the position of a latent image mark and the output state of a light-receiving element;

Fig. 8 is a characteristic view showing the relationship between an intersection angle between the optical axes of a light-projecting element and the light-receiving element and a readable distance of the latent image mark;

Fig. 9 is a view showing the output state of the optical reading apparatus in a case where the surface of a mark carrier is flat;

Fig. 10 is a view showing the output state of the optical reading apparatus in a case where the surface of the mark carrier is concave and convex;

Fig. 11 is a view showing the output state of the optical reading apparatus in a case where the surface of the mark carrier is curved; and

Fig. 12 is a schematic view showing a conventional optical reading apparatus.

## BEST MODE FOR CARRYING OUT THE INVENTION

Before the description of the present invention proceeds, it is to be noted that like parts are designated by like reference numerals throughout the accompanying drawings.

An embodiment of the present invention is described below in detail with reference to Figs. 1 through 6.

Fig. 1 is a plan view showing a handy type optical reading apparatus, according to the embodiment, in which some parts are cut out. Fig. 2 is a sectional view showing the optical reading apparatus. Fig. 3 is a plan view showing a state in which an upper frame of a unit, disposed on a light-receiving side, to be used in the optical reading apparatus is removed. Fig. 4 is a sectional view showing the unit disposed on the light-receiving side. Figs. 5 and 6 are schematic views for describing an optical system of the optical reading apparatus.

As shown in Fig. 2, the handy type optical reading apparatus according to the embodiment essentially comprises an upper casing 1; a lower casing 2; an aperture frame 3; a light-projecting element 4; a mirror 5; an image-forming lens group 6; an optical filter 7; a light-receiving element 8; a control board 9; and a switch 10.

As shown in Fig. 1, a material is molded into the upper casing 1 and the lower casing 2 molded in a configuration which can be easily held by hand, and the switch 10 is arranged at an operable position, with an operator holding the optical reading apparatus by band.

As shown in Fig. 5, the light-projecting element 4 comprises a large number of LED elements arranged in a row to form an array shape, and a lens 11 is provided on the light-projecting side thereof. The light-projecting element 4 is supported by a printed board 12. Although the printed board 12 is not shown, it is fixed to the lower casing 2 accurately. The control board 9 and the printed board 12 are electrically connected with each other by a signal line 13.

The array-shaped light-projecting element 4 is fixed to a position close to the detection surface of an aperture of the optical reading apparatus and emits light to a latent image mark 15 push as a bar code-shaped latent image mark printed on the surface of a mark carrier 14. As shown in Figs. 2 and 6, the light-projecting element 4 is so fixed that the optical axis thereof intersects at 15° with a normal to a surface , to be detected (in a case of a flat surface), on which the latent image mark 15 has been formed.

The light-projecting element 4 emits infrared rays. As a result, fluorescent fine powder contained in the latent image mark 15 are excited and as a result, the latent image mark 15 emits infrared rays having a central wavelength different from that of the infrared rays (fluorescence) emitted by the light-projecting element 4. The fluorescence is reflected by the mirror 5 disposed on the normal to the surface on which the latent image mark 15 has been formed and received by the light-receiving element 8 via the image-forming lens group 6 and the optical filter 7.

The optical filter 7 has optical characteristic of intercepting the infrared rays irradiated by the light-projecting element 4 and transmitting the infrared rays emitted by the latent image mark 15. The optical filter 7 is composed of a monocrystal substrate made of indium phosphorus (InP) or the like.

The light-receiving element 8 comprises a large number of CCD elements arranged in a row and forming an array shape. A detection signal outputted from the light-receiving element 8 is inputted to the control board 9, and then processed. The processed signal is inputted to an unshown personal computer via a cable 16.

The mirror 5, the image-forming lens group 6, and the light-receiving element 8 are mounted in the upper and lower casings 1 and 2 by being sandwiched in position between the upper frame 17 and the lower frame 18, such that the mirror 5, the image-forming lens group 6, and the light-receiving element 8 are spaced from each other at an appropriate interval, as shown in Figs. 3 and 4.

The latent image mark 15 comprises fluorescent fine powder and binder having property of transmitting infrared rays and holding fluorescent fine powder in a dispersed state.

As the fluorescent substance, inorganic compounds comprising a matrix composed of fluoride or oxide such as phosphate, molybdate, or tungstate containing an emission center substance consisting of one element selected from neodymium (Nd), ytterbium (Yb), europium (Eu), thulium (Tm), praseodymium (Pr), and dysprosium (Dy) belonging to rare earth elements or a mixture thereof. Specifically, the following inorganic compounds can be used as the fluorescent substance: $NdP_5O_{14}$, $LiNdP_4O_{12}$, $NaY_{0.69}Yb_{0.3}Er_{0.01}F_4$ and the like.

Inorganic compounds expressed by the following general formula can be also used.

General formula: $Ln_{1-x-y}Nd_xYb_yZ$

The reference symbol Ln of the formula indicates one element or more selected from the group of Bi, Ge, Ga, Gd, In, La, Lu, Sb, Sc, and Y.

The reference symbol Z of the formula is $A_5(MO_4)_4$, where the reference symbol A is one element or more selected from the group of K and Na, and the reference symbol M is one element or more selected from the group of W and Mo;

$D_3(BO_3)_4$, where the reference symbol D is one element or more selected from the group of Al and Cr;

$P_5O_{14}$;

$A_3(PO_4)_2$, where the reference symbol A is one element or more selected from the group of K and Na.

$Na_2Mg_2(VO_4)_3$; and

$A'(MO_4)_2$, where the reference symbol A' is one element or more selected from the group of Li, K, and Na, and the reference symbol M is one element or more selected from the group of W and Mo.

Regarding reference symbols x and y of the formula, when Z is $A_5(MO_4)_4$, x and y are numerical values in a range of $0.25 \leq x \leq 0.99$ and $0.11 \leq y \leq 0.75$;

when Z is $D_3(BO_3)_4$, x and y are numerical values in a range of $0.10 \leq x \leq 0.99$ and $0.01 \leq y \leq 0.90$;

when Z is $P_5O_{14}$, x and y are numerical values in a range of $0.05 \leq x \leq 0.98$ and $0.02 \leq y \leq 0.95$;

when Z is $A_3(PO_4)_2$, x and y are numerical values in a range of $0.02 \leq x \leq 0.98$ and $0.02 \leq y \leq 0.98$;

when Z is $Na_2Mg_2(VO_4)_3$, x and y are numerical values in a range of $0.57 \leq x \leq 0.90$ and $0.01 \leq y \leq 0.43$;

when Z is $A'(MO_4)_2$, x and y are numerical values in a range of $0.20 \leq x \leq 0.95$ and $0.05 \leq y \leq 0.80$.

More specifically, the following substances can be used: $Nd_{0.8}Yb_{0.2}Na_5(WO_4)_4$,

$Nd_{0.9}Yb_{0.1}Na_5(Mo_4)_4$,

$Y_{0.1}Nd_{0.75}Yb_{0.15}(WO_4)_4$,

$Nd_{0.8}Yb_{0.2}Na_5(Mo_{0.5}W_{0.5}O_4)_4$,

$Bi_{0.1}Nd_{0.75}Yb_{0.15}K_5(MoO_4)_4$,

$La_{0.1}Nd_{0.8}Yb_{0.1}(Na_{0.9}K_{0.1})_5(WO_4)_4$, and

$Nd_{0.9}Yb_{0.1}Al_3 (BO_3)_4$

Further, inorganic substances expressed by the following general formula can be also used:

General formula: $EF_{1-x-y}Nd_xYb_yP_4O_{12}$

The reference symbol E of the formula indicates one element or more selected from the group of Li, Na, K, Rb, and Cs.

The reference symbol F of the formula indicates one element or more selected from the group of Sc, Y, La, Ce, Gd, Lu, Ga, In, Bi, and Sb.
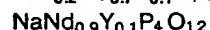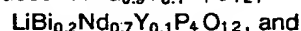
The reference symbols x and y of the formula are numerical values in the following range:

$0.05 \leq x \leq 0.999$

$0.001 \leq y \leq 0.950$

$x + y \leq 1.0$

More specifically, the following substances can be used: $LiNd_{0.9}Y_{0.1}P_4O_{12}$,

$LiBi_{0.2}Nd_{0.7}Y_{0.1}P_4O_{12}$, and

$NaNd_{0.9}Y_{0.1}P_4O_{12}$

Further, oxygacd salt such as phosphate, borate, molybdate, or tungstate containing at least one element selected from Y, La, Gd, and Bi; and Yb. More specifically, inorganic substances expressed by the following general formula can be used:

General formula: $A(Y, La, Gd, Bi)_xYb_{1-x}P_yO_z$

The reference symbol A in the formula indicates one element or more selected from the group of Li, Na, K, Rb, and Cs and is not an essential substance; the reference symbol x of the formula is a numerical value in the range of from 0.01 to 0.99; y of the formula is a numerical value in the range of from 2 to 5; and z of the formula is a numerical value in the range of from 7 to 14.

Favorably, the content of the fluorescent fine powder is suitably 10-80wt% and more favorably 25-70wt%. If the content of the fluorescent fine powder is less than 10wt%, the emission output of the latent image mark 15 is too weak, while if the content of the fluorescent fine powder is more than 80wt%, it is difficult to print the latent image mark 15 and further, there is a possibility that the latent image mark 15 is separated from the mark carrier 14, because the adhering strength of the mark is weak.

As the binder, solvent-free type such as ultraviolet-curing resin which is hardened by ultraviolet rays, solvent type such as polyurethane, and water-soluble type such as polyvinyl alcohol (PVA) can be used and selected appropriately depending on printing method or the quality of the material of an object to be detected. If necessary, placiticizer or surface active agent may be appropriately contained in the mixture.

As shown in Fig. 2, in the embodiment, the focal length of the lens 11 is so designed that the focal length is slightly outwardly elongated from the detection aperture of the aperture frame 3 so that the mark carrier 14 can be read when the detection aperture is disposed in the vicinity of the latent image mark 15, even though the detection aperture is not brought into contact with the mark carrier 14 surely.

As described previously, in the optical reading apparatus, the intersection angle $\theta$, on the latent image mark 15, between the optical axis of the light-projecting element 4 and that of the light-receiving element 8 is set to 15°. A position at which the distance between the lens 11 and the latent image mark 15 coincides with the focal length of the lens 11 is set to a 0mm-position (reference position) of the latent image mark 15, and the change in the output voltage of the light-receiving element 8 is measured by approaching the latent image mark 15 from the reference position to the apparatus and moving it away therefrom. The result is shown in Fig. 7.

In Fig. 7, the abscissa indicates the position of the latent image mark 15; the left ordinate indicates the output voltage of the light-receiving element 8; and the right ordinate indicates the output efficiency of the light-receiving element 8 with respect to the output voltage of the light-receiving element 8 which is set to 100 when the position of the latent image mark 15 is 0mm.

As apparent from Fig. 7, when the position of the latent image mark 15 is 0mm, i.e., when the distance between the lens 11 and the latent image mark 15 coincides with the focal length of the lens 11, the output voltage of the light-receiving element 8 is highest. When the distance between the apparatus and the latent image mark 15 is longer or shorter than the focal length, the output voltage of the light-receiving element 8 drops in an approximately parabola configuration.

From results obtained by the present inventors' various experiments, it has been found that when the output efficiency of the light-receiving element 8 is less than 50%, S/N becomes small and thus the latent image mark 15 cannot be read correctly. Accordingly, in this embodiment (intersection angle $\theta = 15°$), the distance which can be read is a range between approximately +10mm and approximately -10mm (approximately 20mm), with a position at which the output efficiency is 50%, namely, the reference position set to the center position. That is, in this embodiment, the range in which the latent image mark 15 can be read is formed in a range of about 20mm from the outer surface of the light-projecting and light-receiving detection aperture to a certain position in the direction in which the latent image mark 15 moves away from the

aperture.

Fig. 8 is a view showing the change in the distance (the position at which the output efficiency of the light-receiving element 8 is 50%) which can be read when the intersection angle θ is varied.

As clear from Fig. 8, the distance which can be read becomes extremely short with the increase of the intersection angle θ. As in the case of the conventional apparatus, when the intersection angle θ is 45°, the maximum distance which can be read is 5mm (±2.5mm) or less, and hence, if the surface of the mark carrier 14 is irregular as in the case of a confectionery bag or curved in a small radius of curvature, the latent image mark 15 cannot be read reliably.

Because in a natural state, the difference between the highest portion of the surface (surface in a region in which the latent image mark 15 is printed) of a commodity such as a confectionery bag and the lowest portion thereof is approximately 6mm (±3mm) on the average, the latent image mark 15 can be read reliably if the readable distance is 6mm or more. As apparent from the experimental result shown in Fig. 8, it is necessary to restrict the intersection angle θ to 40° or less so that the readable distance is 6mm (±3mm) or more. When the intersection angle θ is set to 30°, the readable distance increases to 10mm (twice as large as the readable distance when the intersection angle θ is 45° in the conventional apparatus). When the intersection angle θ is set to 15°, the readable distance increases to 20mm (four times as large as the readable distance when the intersection angle θ is 45° in the conventional apparatus). Thus, preferably, the intersection angle θ is set to 30° or less. But to set the intersection angle θ small causes the size of parts of the optical system such as the light-projecting element 4, the mirror 5, the image-forming lens group 6, and the light-receiving element 8 and the arrangement thereof to be in a limited condition. Thus, the preferably, the intersection angle θ is regulated in the range from 10°-30°.

Figs. 9 and 10 are views showing the reading state, obtained by using the optical reading apparatus (intersection angle θ = 15°), of the bar code-shaped latent image mark 15, the minimum width of which is 0.5mm, printed on a sheet of paper. Fig. 9 is a view showing the output state of the light-receiving element 8 in the case of a flat sheet of paper. Fig. 10 is a view showing the output state thereof in the case where a sheet of paper is wrinkled to set, to about 6mm (±3mm) on the arrange, the difference between the highest portion of the surface of the paper in a region in which the latent image mark 15 is printed and the lowest portion thereof.

Fig. 11 is a view showing the output state of the light-receiving element 8 in the case (distance between the optical reading apparatus and the latent image mark 15 is 6mm) where the bar code-shaped latent image mark 15, the minimum width of which is 0.6mm, is printed on a sheet of paper curved in a radius of curvature of 15mm and the latent image mark 15 is read by the optical reading apparatus (intersection angle θ = 15°).

As apparent from Figs. 10 and 11, it can be proved that by using the optical reading apparatus according to this embodiment, the latent image mark 15 can be reliably read regardless of whether the surface of the mark carrier 14 is flat, irregular with large difference between the highest and lowest portions thereof, or curved.

In the above-described embodiment, the fluorescent substance excited by projected infrared rays has been described, but the present invention is applicable to an optical reading apparatus using a fluorescent substance excited by projected ultraviolet rays.

In comparing the fluorescent substance excited by ultraviolet rays and the fluorescent substance excited by infrared rays with each other, in the former, fluorescence is visible whereas in the latter, fluorescence is invisible. Thus, the latter is advantageous in security and has a long life and hence can be more favorably used than the former.

As described above, the range in which the latent image mark 15 can be read is formed by setting a point at which the optical axis of the light-projecting member (for example, the light-projecting element 4) and that of the light-receiving member (for example, the light-receiving element 8 and the optical frame 7) intersect with each other as the reference. Further, even though the distance between the light-projecting member and the latent image mark and the distance between the light-receiving member and the latent image mark are nonuniform, adverse effect can be reduced to the utmost by setting the intersection angle between the two optical axes to 40° or less. Thus, the present invention can provide a reliable handy type optical reading apparatus capable of reading the latent image mark printed on the mark carrier regardless of whether the surface of the mark carrier 14 is flat, irregular, curved or stepped.

Although the present invention has been fully described in connection with the preferred embodiments thereof with reference to the accompanying drawings, it is to be noted that various changes and modifications are apparent to those skilled in the art. Such changes and modifications are to be understood as included within the scope of the present invention as defined by the appended claims unless they depart therefrom.

## Claims

1. An optical reading apparatus for reading a latent image mark, comprising:
   a light-projecting member (4) for projecting on a surface of the latent image mark (15) light having a wavelength to excite a fluorescent substance contained in the latent image mark having desired information; and
   light-receiving members (8, 7) for receiving fluorescence emitted from the surface of the latent image mark,
   wherein a range in which the latent image mark can be read is formed by setting a point at which an optical axis of the light-projecting member and that of the light-receiving member intersect with each other as a reference; and an intersection angle between the two optical axes is restricted to 40° or less.

2. The optical reading apparatus according to claim 1, wherein the intersection angle is restricted to be in the range from 10° to 30°.

3. The optical reading apparatus according to claim 1, wherein the light-projecting member and the light-receiving members are held by casings (1, 2); and the range in which the latent image mark can be read is formed in a range from an outer surface of a light-projecting and light-receiving detection aperture of the casings to a certain position in a direction in which the latent image mark moves away from the aperture.

4. The optical reading apparatus according to claim 1, wherein the fluorescent substance is excited by infrared rays.

5. The optical reading apparatus according to claim 1, wherein the fluorescent substance is excited by ultraviolet rays.

5

10

15

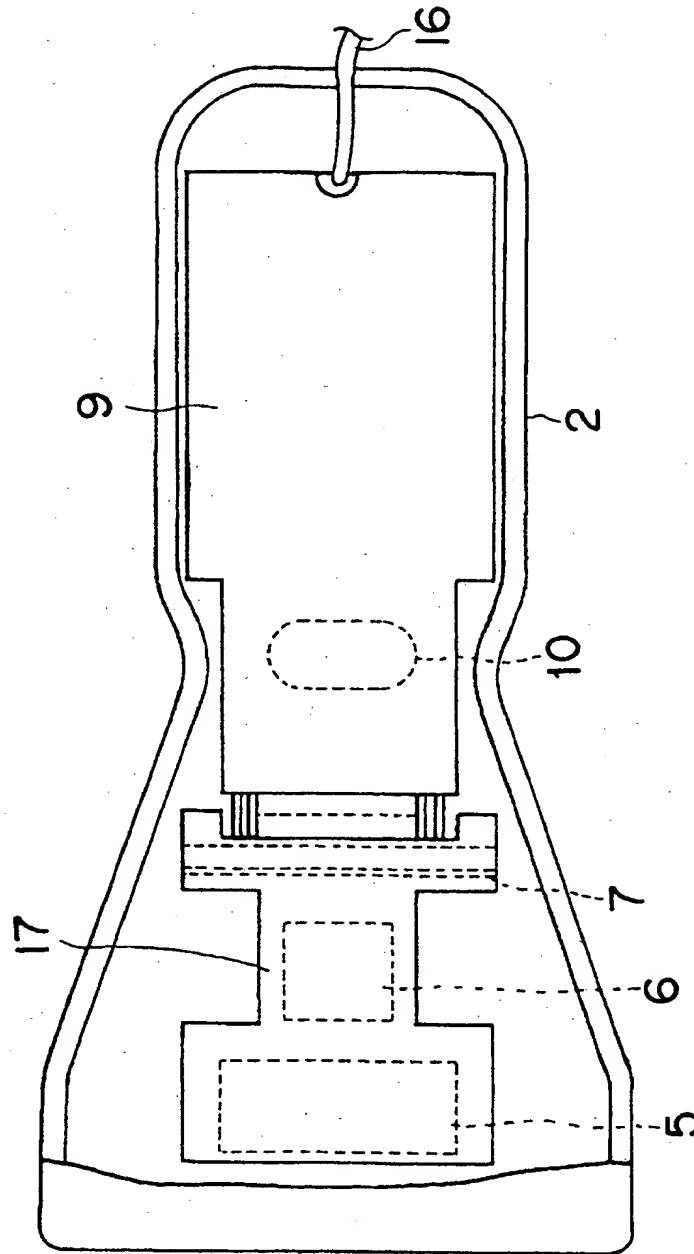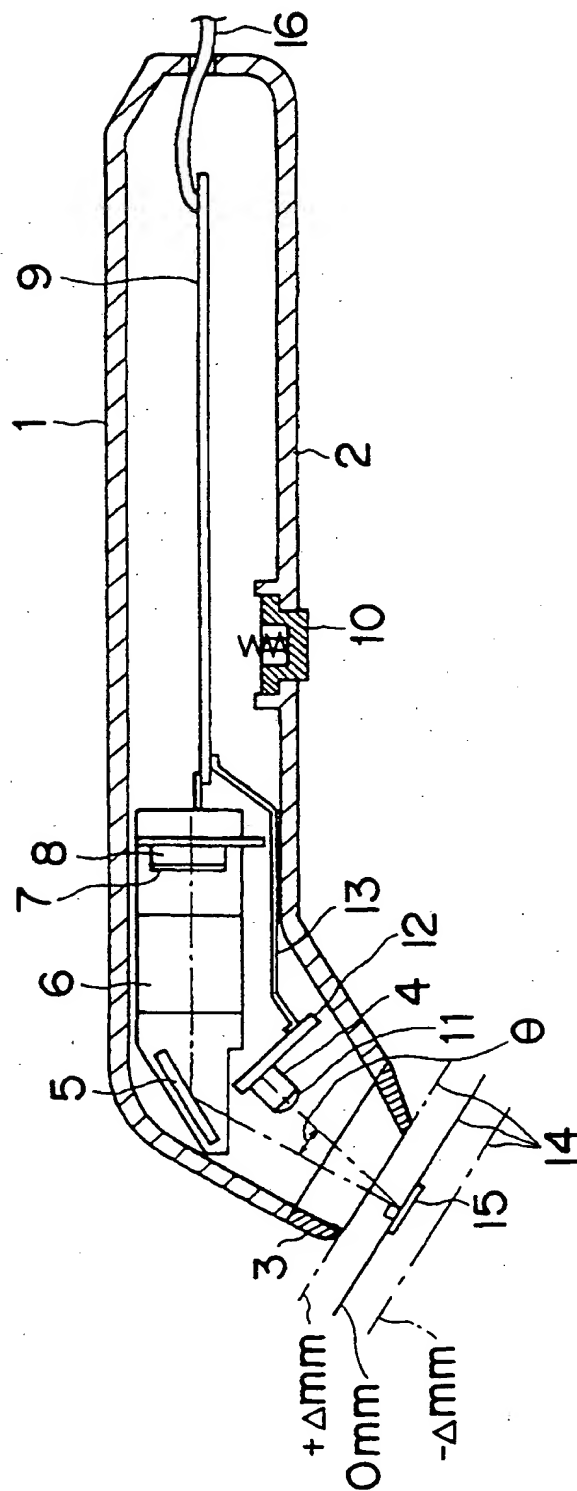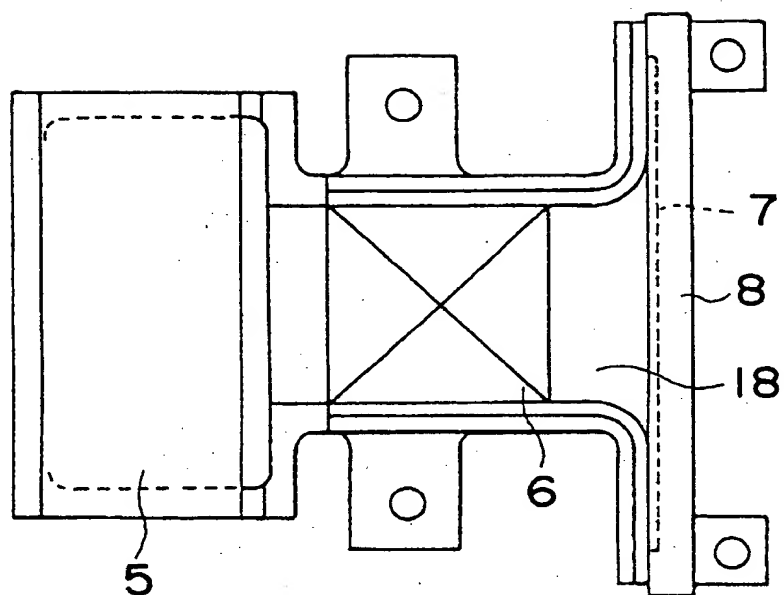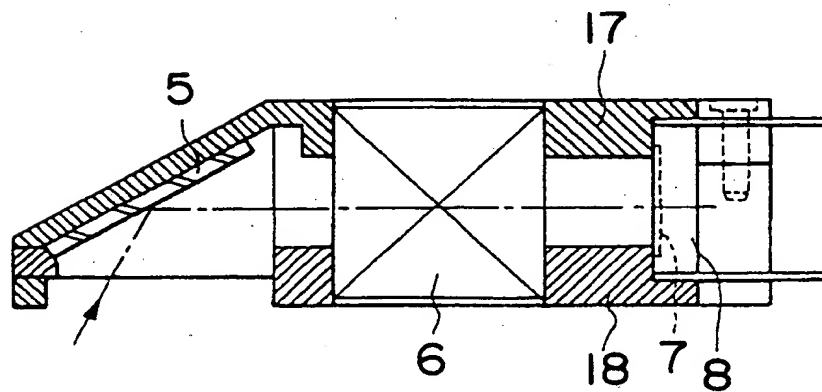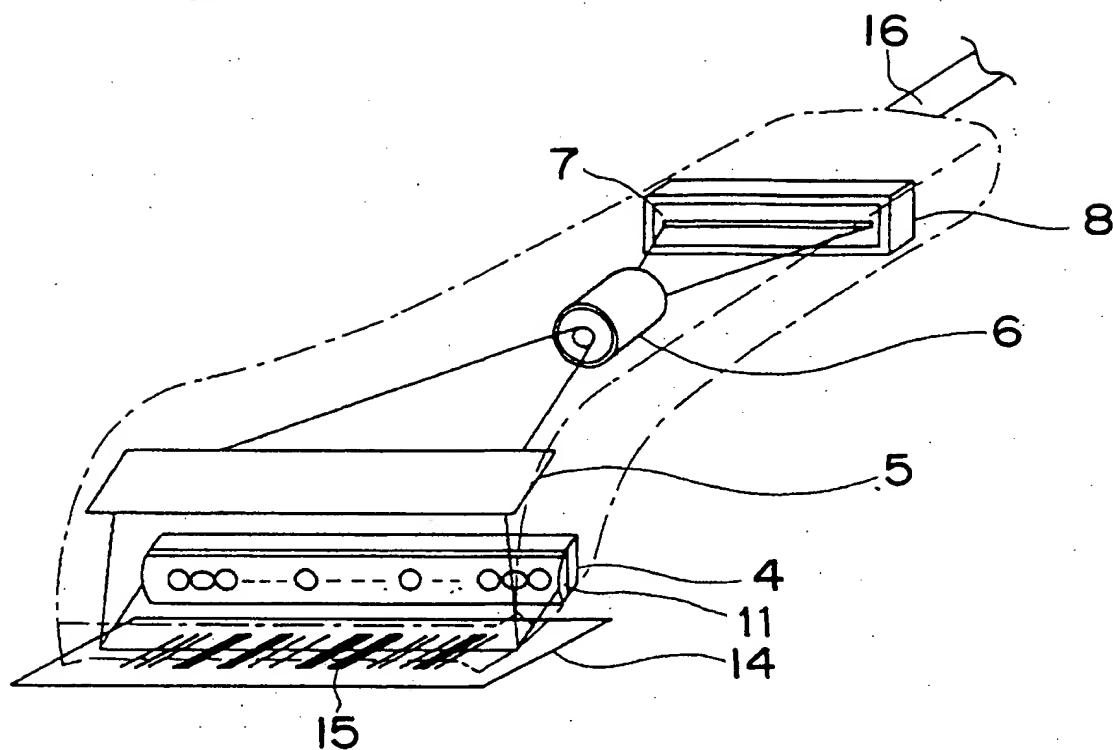20

25

30

35

40

45

50

55

Fig. 1

Fig. 2

*Fig. 3*



*Fig. 4*

Fig. 5

Fig. 6

Fig. 7



POSITION OF LATENT IMAGE
MARK (mm)

Fig. 8

Fig. 9

LATENT IMAGE MARK

OUTPUT
VOLTAGE
(mV)

TIME

Fig. 10

LATENT IMAGE MARK

OUTPUT
VOLTAGE
(mV)

TIME
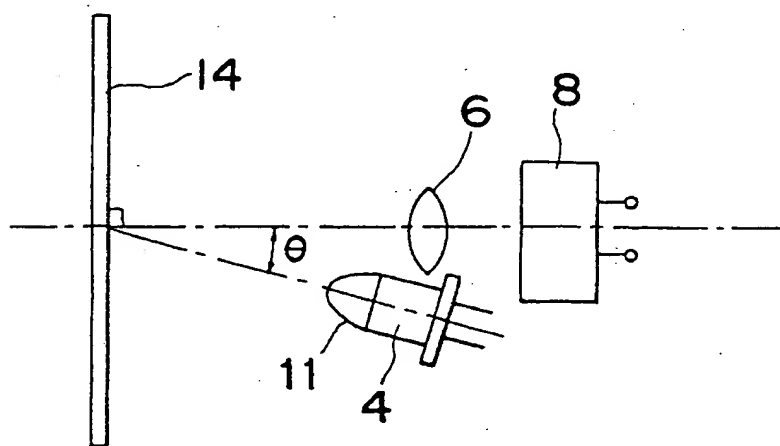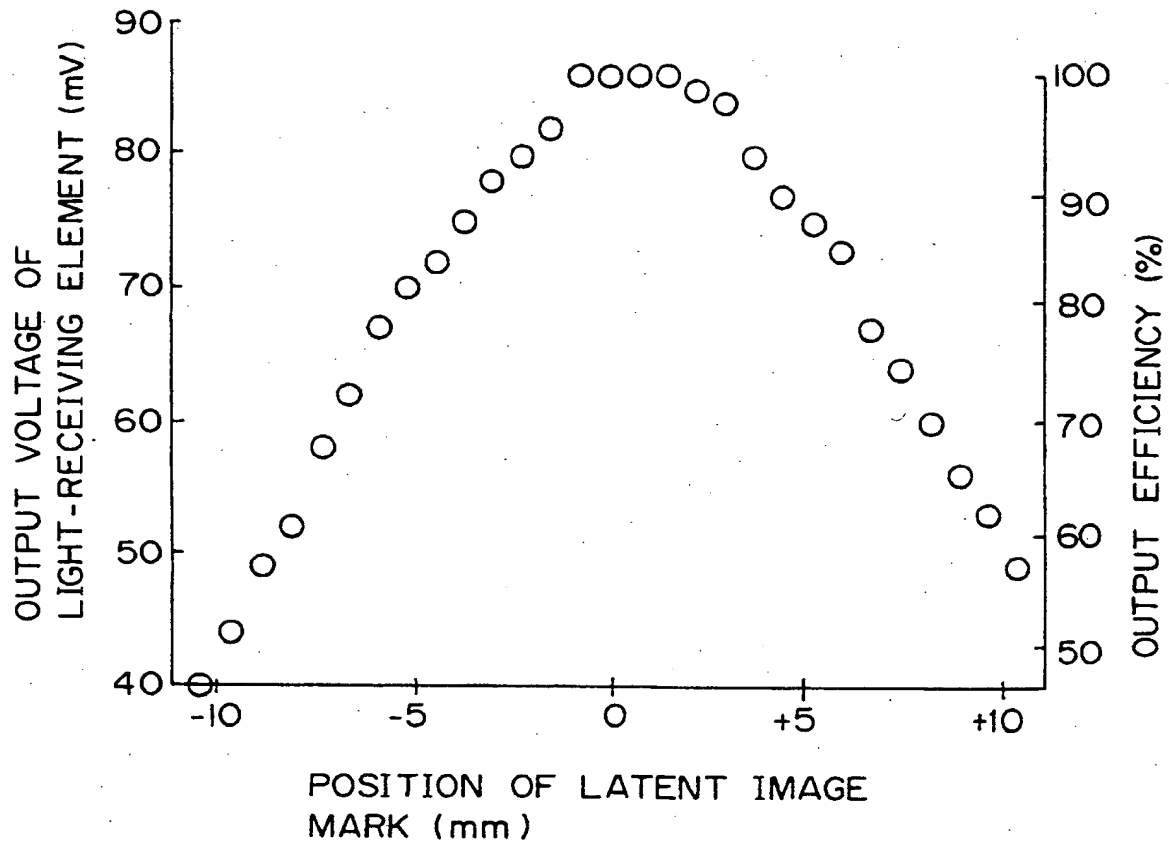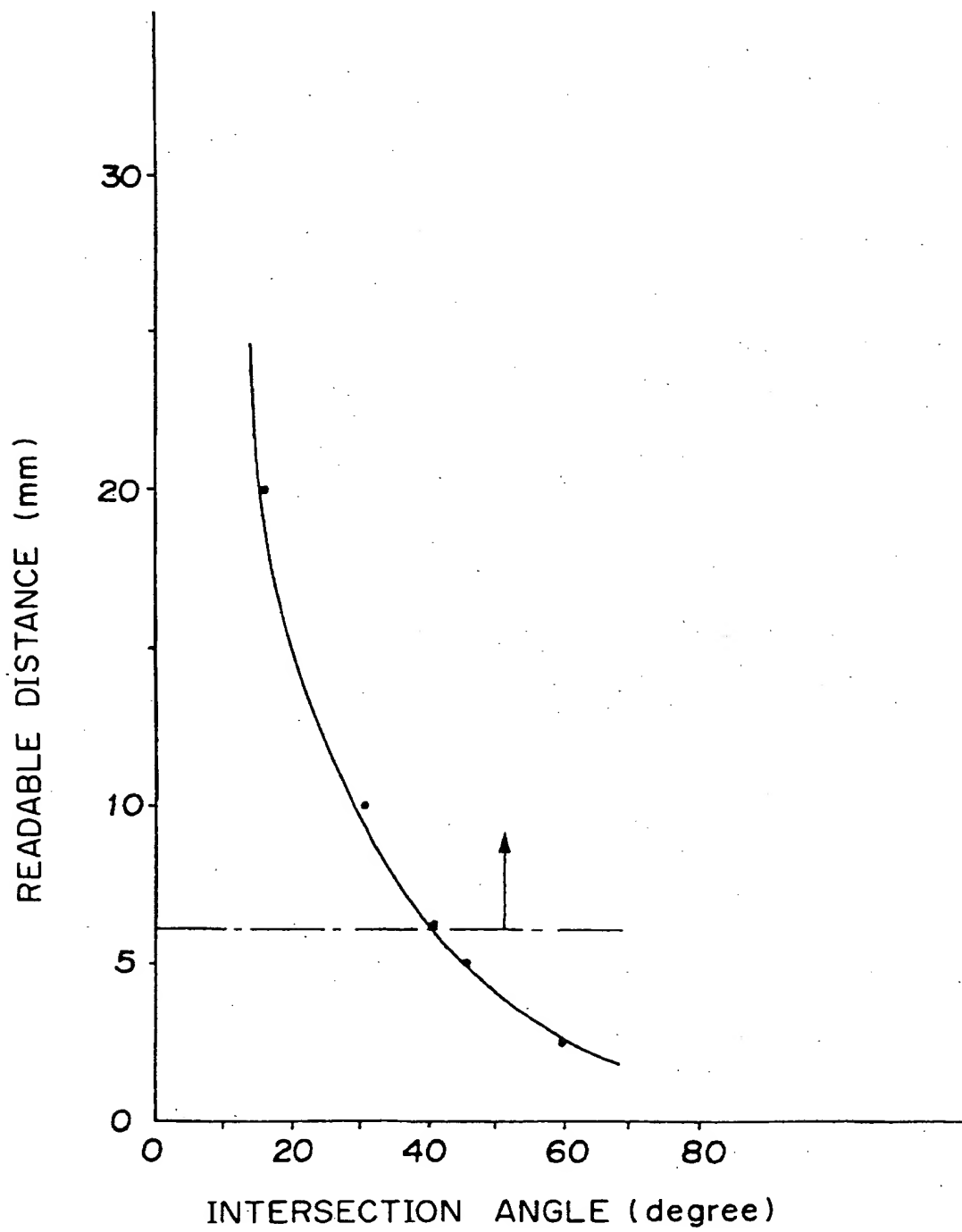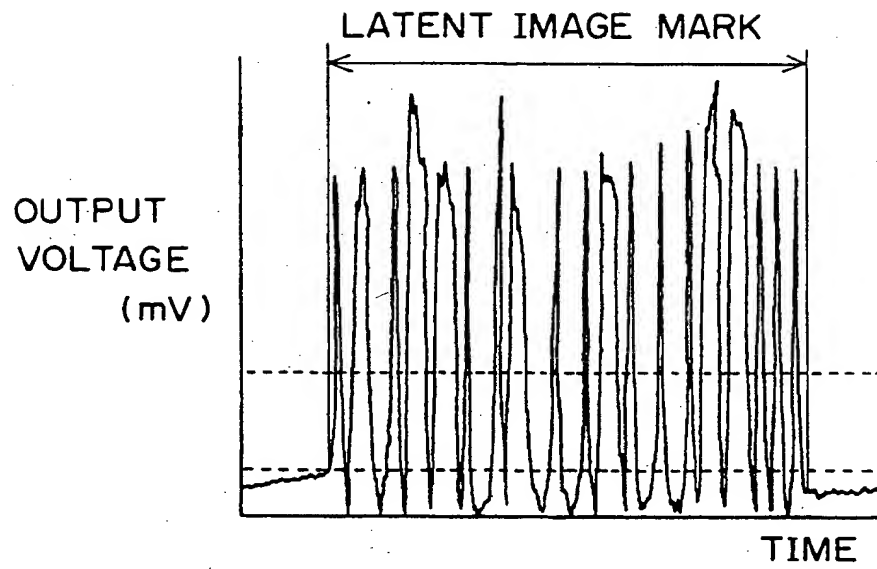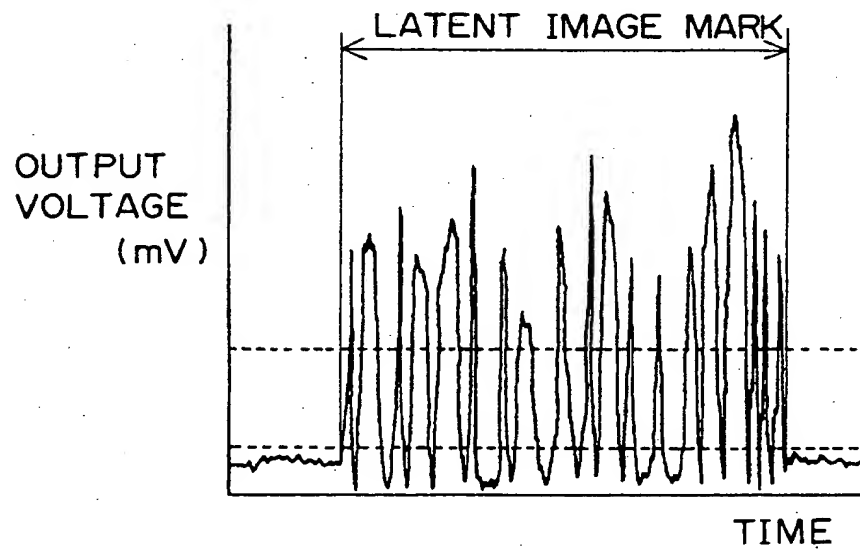
Fig. 11



Fig. 12

# INTERNATIONAL SEARCH REPORT

## A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl$^5$  G06K7/00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Int. Cl$^5$  G06K7/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

| | |
|---|---|
| Jitsuyo Shinan Koho | 1926 – 1993 |
| Kokai Jitsuyo Shinan Koho | 1971 – 1993 |

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | JP, A, 60-83184 (Mitsubishi Electric Corp.), May 11, 1985 (11. 05. 85), (Family: none) | 1-4 |
| Y | JP, A, 59-121474 (Toyoda Tsusho K.K.), July 13, 1984 (13. 07. 84), (Family: none) | 5 |

☐ Further documents are listed in the continuation of Box C.  ☐ See patent family annex.

| | |
|---|---|
| *     Special categories of cited documents: | "T"  later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention |
| "A"  document defining the general state of the art which is not considered to be of particular relevance | |
| "E"  earlier document but published on or after the international filing date | "X"  document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone |
| "L"  document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) | "Y"  document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art |
| "O"  document referring to an oral disclosure, use, exhibition or other means | |
| "P"  document published prior to the international filing date but later than the priority date claimed | "&"  document member of the same patent family |

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| July 25, 1994 (25. 07. 94) | August 23, 1994 (23. 08. 94) |

| Name and mailing address of the ISA/ | Authorized officer |
|---|---|
| Japanese Patent Office | |
| Facsimile No. | Telephone No. |

Form PCT/ISA/210 (second sheet) (July 1992)